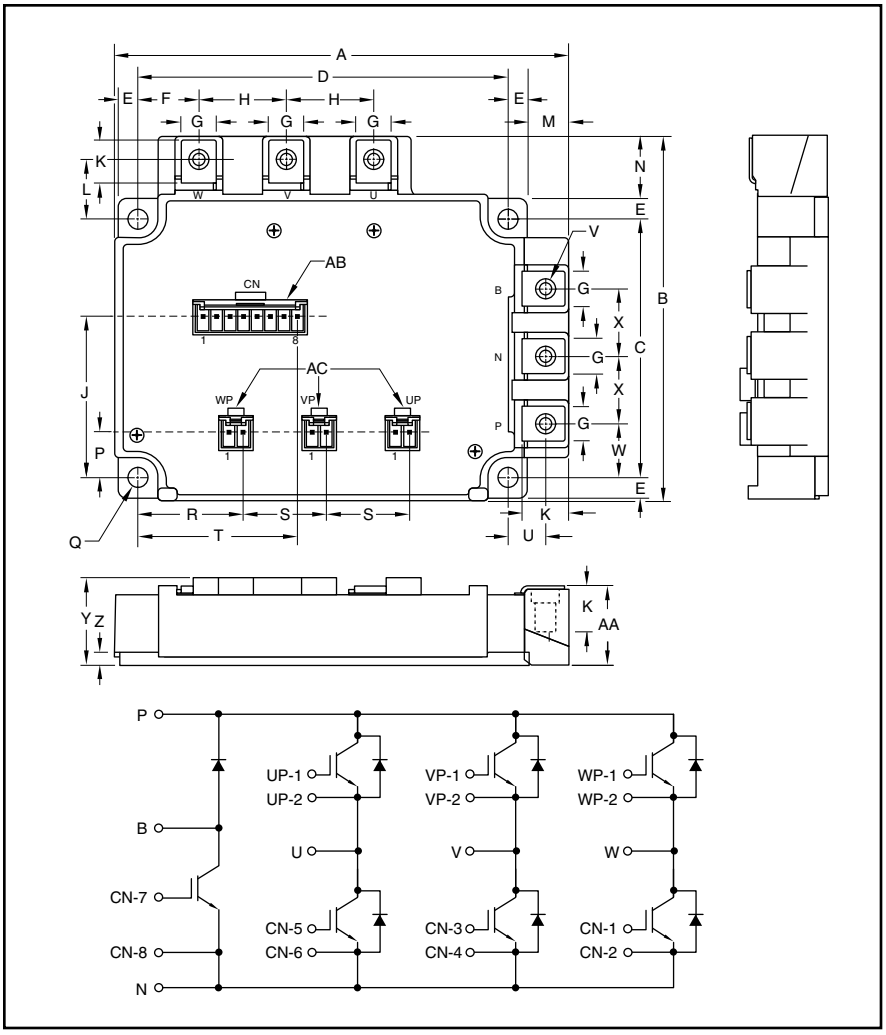
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

Six IGBTMOD™ + Brake NF-Series Module
150 Amperes/1200 Volts



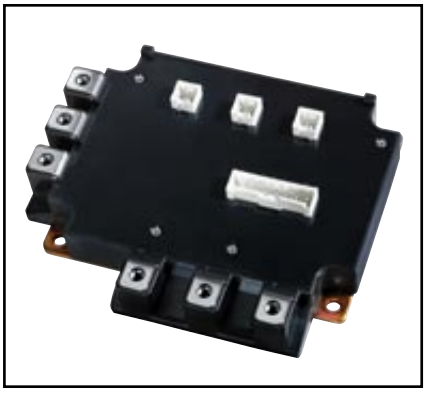
Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.32	135.0
B	4.33±0.02	110.0±0.5
C	3.07	78.0
D	4.33±0.02	110±0.5
E	0.24	6.05
F	0.69	17.5
G	0.41	10.5
H	1.02	26.0
J	1.92	48.75
K	0.51	13.0
L	0.71	18.0
M	0.46	11.7

Dimensions	Inches	Millimeters
N	0.74	18.7
P	0.54	13.75
Q	0.22	5.5 Dia.
R	1.20	30.5
S	0.98	25.0
T	1.82	46.3
U	0.43	11.0
V	M5	M5
W	0.65	16.5
X	0.78	20.0
Y	1.04	26.5
Z	0.16	4.0
AA	0.95+0.04/-0.0	24.1+1.0/-0.0

Housing Types (J.S.T. Mfg. Co. Ltd.)

AB – B8P-VH-FB-B
AC – B2P-VH-FB-B



Description:
Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase bridge configuration and a seventh IGBT with free-wheel diode for dynamic braking. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:
- ☐ Low Drive Power
- ☐ Low $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ Photovoltaic/Fuel Cell

Ordering Information:
Example: Select the complete module number you desire from the table below -i.e. CM150RL-24NF is a 1200V (V_{CES}), 150 Ampere Six-IGBTMOD™ + Brake Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	150	24

Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Characteristics	Symbol	CM150RL-24NF	Units
Power Device Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws	—	31	in-lb
Module Weight (Typical)	—	750	Grams
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

Inverter Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 76°C)*	I_C	150	Amperes
Peak Collector Current (Tj ≤ 150°C)	I_{CM}	300**	Amperes
Emitter Current***	I_E	150	Amperes
Peak Emitter Current***	I_{EM}	300**	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j < 150°C)	P_C	890	Watts

Brake Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	1200	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 86°C)*	I_C	75	Amperes
Peak Collector Current (Tj ≤ 150°C)	I_{CM}	150**	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j < 150°C)	P_C	520	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}	1200	Volts
Forward Current (Clamp Diode Part)	I_{FM}	75	Amperes

*T_C, T_f measured point is just under the chips.
**Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
***Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Inverter Sector

Characteristics		Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current		I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	I_C = 15mA, V_{CE} = 10V	6	7	8	Volts
Gate Leakage Current		I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	I_C = 150A, V_{GE} = 15V, T_j = 25°C	—	2.1	3.0	Volts
			I_C = 150A, V_{GE} = 15V, T_j = 125°C	—	2.4	—	Volts
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	23.0	nf
Output Capacitance		C_{oes}		—	—	2.0	nf
Reverse Transfer Capacitance		C_{res}		—	—	0.45	nf
Total Gate Charge		Q_G	V_{CC} = 600V, I_C = 150A, V_{GE} = 15V	—	675	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 600V, I_C = 150A, $V_{GE1} = V_{GE2}$ = 15V, R_G = 2.1Ω, I_E = 150A, Inductive Load Switching Operation	—	—	130	ns
Load	Turn-on Rise Time	t_r		—	—	70	ns
Switch	Turn-off Delay Time	$t_{d(off)}$		—	—	400	ns
Time	Turn-off Fall Time	t_f		—	—	350	ns
Reverse Recovery Time*		t_{rr}		—	—	150	ns
Reverse Recovery Charge*		Qrr		—	5.8	—	µC
Emitter-Collector Voltage*		V_{EC}	I_E = 150A, V_{GE} = 0V	—	—	3.8	Volts

Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case**	$R_{th(j-c)}Q$	Per IGBT 1/6 Module	—	—	0.14	°C/W
Thermal Resistance, Junction to Case**	$R_{th(j-c)}D$	Per FWDi 1/6 Module	—	—	0.23	°C/W
Contact Thermal Resistance	$R_{th(c-f)}$	Per 1/6 Module, Thermal Grease Applied	—	0.051	—	°C/W
External Gate Resistance	R_G		2.1	—	31	Ω

*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
**T_C, T_f measured point is just under the chips.

Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Brake Sector

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 7.5mA	6	7	8	Volts
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 75A, V_{GE} = 15V, T_j = 25°C	—	2.1	3.0	Volts
		I_C = 75A, V_{GE} = 15V, T_j = 125°C	—	2.4	—	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	11.5	nf
Output Capacitance	C_{oes}		—	—	1.0	nf
Reverse Transfer Capacitance	C_{res}		—	—	0.23	nf
Total Gate Charge	Q_G	V_{CC} = 600V, I_C = 75A, V_{GE} = 15V	—	338	—	nC
Forward Voltage Drop	V_{FM}	I_F = 75A	—	—	3.8	Volts

Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case*	$R_{th(j-c)}Q$	Per IGBT 1/6 Module	—	—	0.24	°C/W
Thermal Resistance, Junction to Case*	$R_{th(j-c)}D$	Per FWDi 1/6 Module	—	—	0.36	°C/W

*T_C, T_f measured point is just under the chips.

CM150RL-24NF
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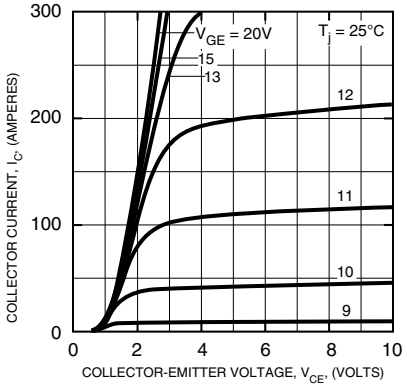
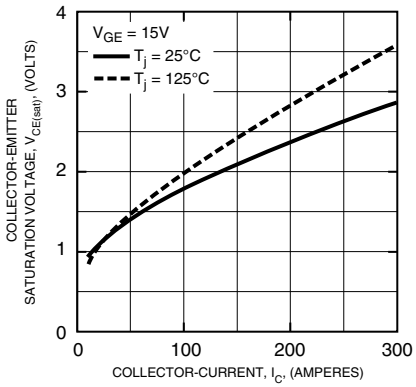
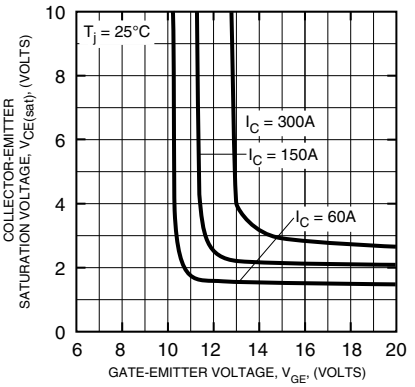
OUTPUT CHARACTERISTICS (TYPICAL)



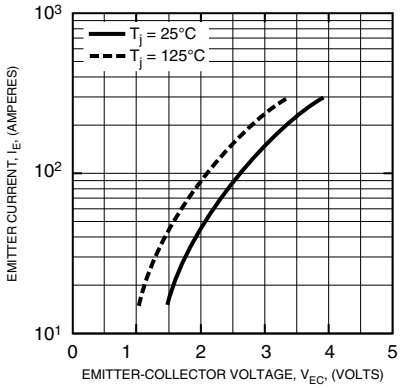
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



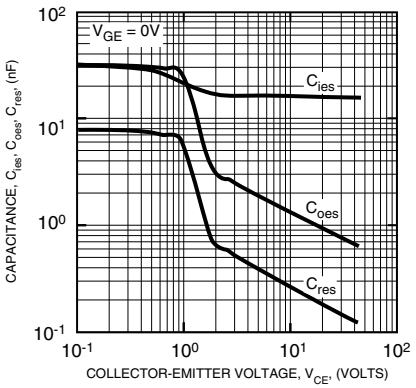
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



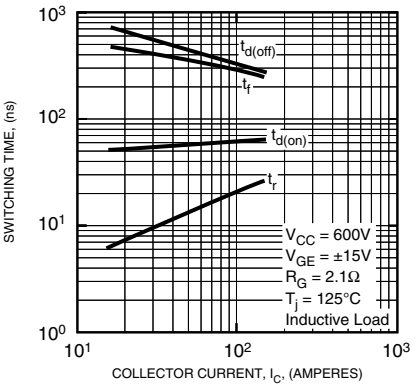
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



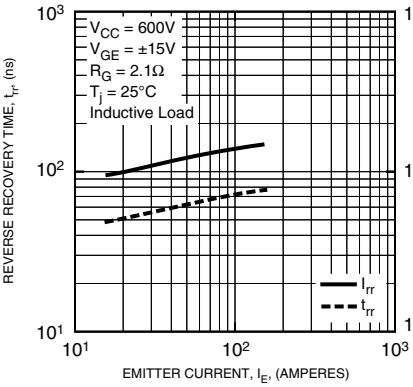
CAPACITANCE VS. V_{CE} (TYPICAL)



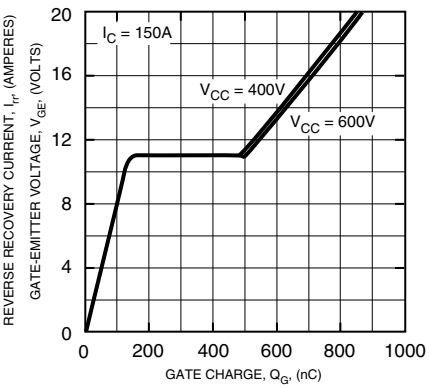
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



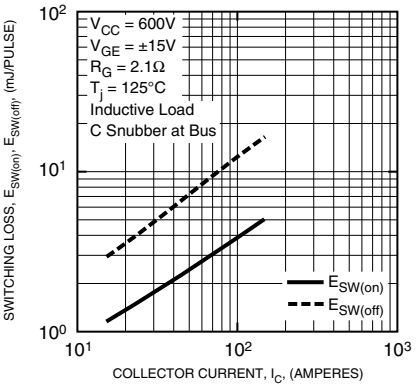
REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE VS. V_{GE}



SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)



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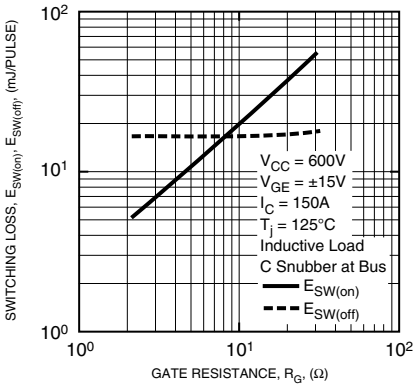
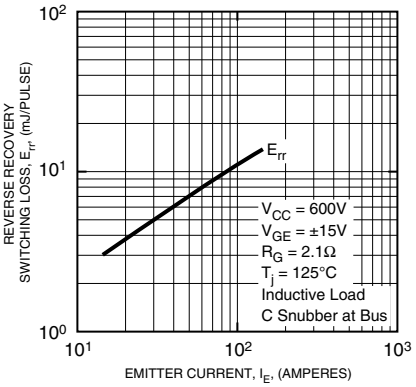
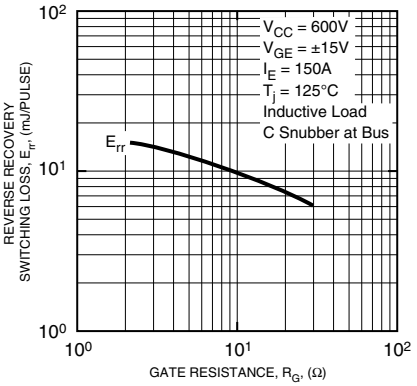
SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS. EMITTER CURRENT (TYPICAL)



REVERSE RECOVERY SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDi)